Bays, Estuaries, and Riparian Habitats

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♦ *Priority Issues*:
- Habitat Modification
- Pollution
- Biodiversity / Ecosystem Integrity
- Invasive Species
- Global, Large Scale Human Impacts

♦ *Priority Questions* (for each issue above):
- What is the extent of impact?
- Which resources are affected?
- How can we best monitor effectiveness of restoration, prevention and preservation efforts?
- What are the opportunities for restoration, prevention and preservation efforts?
- What are historic conditions and carrying capacities?
- Is status changing?
- What is seasonal, annual, long-term and spatial variability?

♦ *Characterization of Priority Issues or Questions*:

Habitat Modification - Habitat Loss
Parameters - Area of marsh, wetland and riparian habitats
Methods - Aerial surveys/GIS analysis for habitat acreage, field surveys to ground truth above and measure habitat structure (with biodiversity)
Spatial Scale - From satellite imagery to quarter meter quadrats with emphasis on developed coastal areas

Temporal Scale - Every two to five years, indefinitely
Frequency - Winter and summer seasons
Existing Data/Programs - USGS hydrologic quad resources (NHD), numerous habitat maps

Habitat Modification - Bottlenecks, Sinks, Rivermouths, Confluences and Harbors
Parameters - Pollutant loading and biological impacts, sources, sediment and flow dynamics
Methods - Chemical, tissue, and sediment samples; plume characterizations with aerial photos; species composition at all levels
Spatial Scale - Specific regions or habitats of concern
Temporal Scale - Five years rotations and after storm events (depends on parameter), indefinitely
Frequency - Parameter dependent
Existing Data/Programs - NPDES, Mussel Watch, Municipalities

Is the number of invading species changing in the Sanctuary?
Parameters - Species richness of exotics, abundance of a few know pest species
Methods - Will vary by habitat and taxon
Spatial Scale - Entire MBNMS
Temporal Scale - Indefinitely
Frequency - Twice per year
Existing Data/Programs - Wasson et al. summary; Grosholtz detailed studies
Additional Comments - Must look beyond just estuaries and identify the source; a key is to detect invasions early for best chance of eradication

What are the impacts of invading species on specific communities and habitats?
Parameters - Species richness, abundance, distribution, and behavior of target species, selected physical or chemical parameters
Methods - Will vary by habitat and taxon
Spatial Scale - Entire MBNMS
Temporal Scale - Indefinitely
Frequency - Twice per year
Existing Data/Programs - Grosholtz impact of green crabs
Additional Comments - Must look at links between invasive and native species

What are estuarine ecosystem components?
Parameters - Communities structure, biodiversity, patchiness, and productivity in salt marshes, eelgrass, and mudflats
Methods - Use the diversity of bird species as indicators; sediment samples, species lists, invertebrates and microbial communities, density of dominant plants; remote sensing, GIS and local counts; comprehensive baseline surveys, inventory and mapping
Spatial Scale - Entire Sanctuary, down to individual habitats
Temporal Scale - Indefinitely
Frequency - Two to four times per year
Additional Comments - Long-term community involvement for funding and help in comprehensive sampling

Pollutants

Parameters - Nutrients, pathogens, sediments, organophospates, chlorinated hydrocarbons; bioaccumulation, toxicity analysis and basic physical parameters

Methods - Standard methods and new technologies (e.g., for nitrates)

Spatial Scale - Rivermouths and watersheds to help identify sources, at risk nearshore habitats

Temporal Scale - Indefinitely

Frequency - Monthly and after storm events

Existing Data/Programs – Numerous (e.g., MBNMS WQPP, CDFG, CRWQCB)

Additional Comments - Initial sampling is needed to identify watershed loading and source allocations contributing to loading